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Focused Feasibility Study for the Prairie du Chien/Jordan Gradient Control Modifications

ENSR Corporation
February 2000
Document Number 1620-013-500

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FOCUSED FEASIBILITY STUDY
FOR THE PRAIRIE DU CHIEN/JORDAN GRADIENT CONTROL MODIFICATIONS

SUBMITTED TO THE

REGIONAL ADMINISTRATOR
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V

EXECUTIVE DIRECTOR
MINNESOTA POLLUTION CONTROL AGENCY

BY

THE CITY OF ST. LOUIS PARK, MINNESOTA

PURSUANT TO
CONSENT DECREE - REMEDIAL ACTION PLAN
SECTION 7.4

UNITED STATES OF AMERICA, ET AL.

vs.

REILLY TAR AND CHEMICAL CORPORATION, ET AL.

UNITED STATES DISTRICT COURT
DISTRICT OF MINNESOTA
CIVIL NO. 4-80-469

FEBRUARY 14, 2000

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1.0 INTRODUCTION

1.1. Purpose and Organization of Report

The purpose of this Focused Feasibility Study (FFS) is to evaluate remedial alternatives for the Prairie du Chien/Jordan (PCJ) Gradient Control System. This FFS is designed to evaluate the three alternatives listed in the Minnesota Pollution Control Agency's (MPCA) and the United States Environmental Protection Agency's (EPA), collectively called the Agencies, letter dated November 2, 1999. The Agencies' November 2, 1999, letter identified the following three remedial alternatives:

1. Re-establishing pumping at the Methodist Hospital well (W48)
2. Install a replacement well in the vicinity of well W48
3. Establish full time pumping at well SLP6

The alternatives described in this report are intended to address the monitoring and control of groundwater in the PCJ Aquifer around the former Reilly Tar and Chemical Corp. (Reilly) Site (Site) in St. Louis Park, Minnesota (Figure 1-1).

The remainder of Section 1.0 presents the Site background and history, and remedial action objectives. The remedial technologies are identified and evaluated in Section 2.0. The technologies identified are used to develop remedial alternatives in Section 3.0. These alternatives also undergo a detailed analysis in Section 3.0. The recommended remedial alternative is presented in Section 4.0 along with a conceptual design of this alternative.

1.2. Background and Site History

Between 1917 and 1972, Reilly operated a coal tar distillation and wood preserving plant, known as the Republic Creosote Company. Wastewater from plant operations was discharged to ditches that drained to a swamp south of the Site. Additional releases of creosote and coal tar resulted from drippings and spills onto the soil. The major constituents of coal tar are phenolic compounds and polynuclear aromatic hydrocarbons (PAHs). Some PAH compounds are carcinogenic and are of concern when a source of drinking water is contaminated with these compounds. As used here, "contaminated" or "contamination" means PAH or phenolics in the soil or groundwater resulting from activities of Reilly at the Site.

Because of extensive residential development in the area around the Site in the 1940s and into

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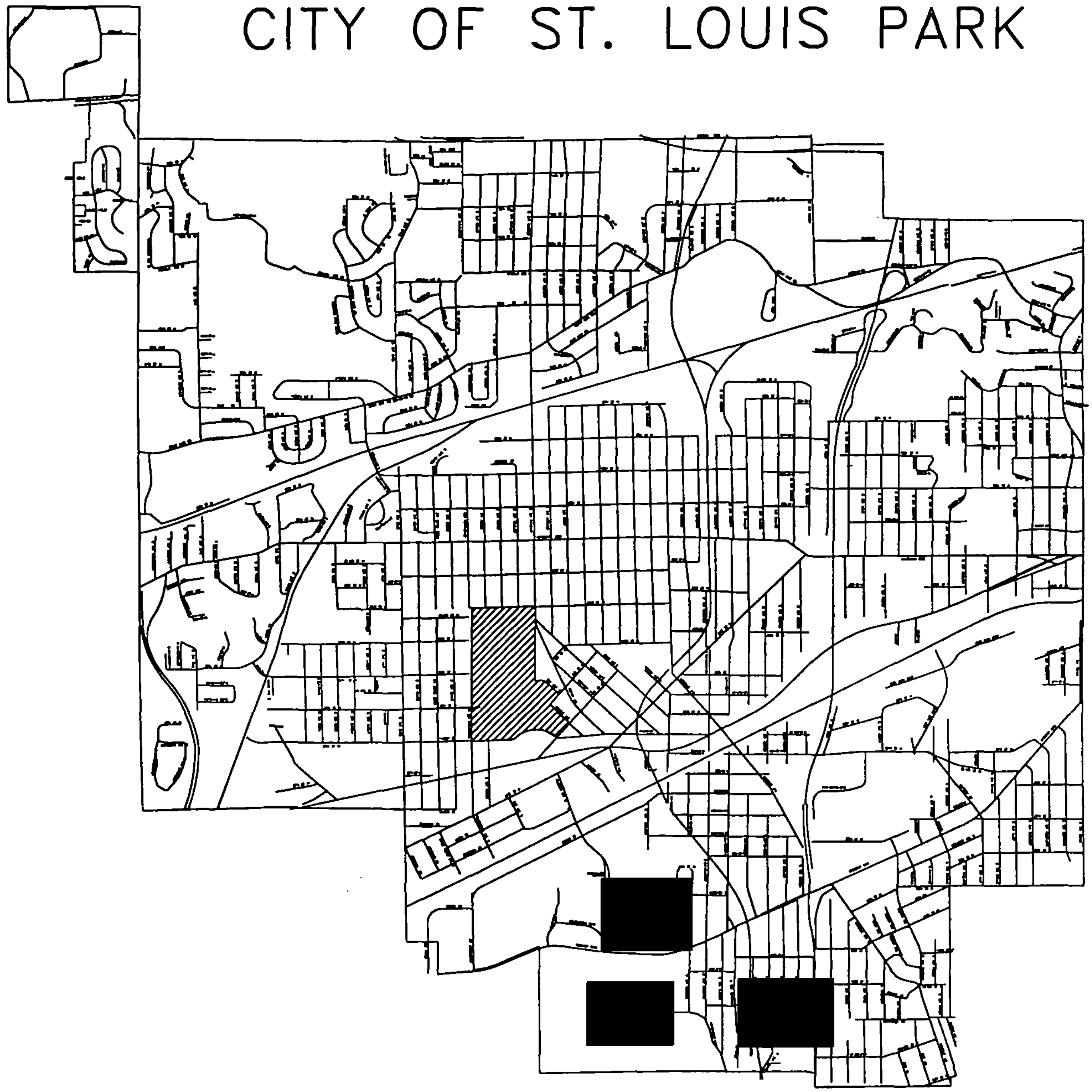

REILLY SITE

SLP6 WELL LOCATION
WELL IDENTIFICATION

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FIGURE 1-1

SITE LOCATION MAP

DRAWN: AJJ	DATE: 2/12/99	PROJECT No.: 1620-013	REV:
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the 1950s, complaints about shallow well contamination and odors became a problem. As a result of the continuing problems with air emissions, and soil and surface water contamination, the City of St. Louis Park (City) and the MPCA filed suit against Reilly in 1970. In 1972, the City purchased the Site from Reilly and the plant was dismantled and removed. The City dropped its lawsuit against Reilly as a condition of the sale. The MPCA did not drop its suit, which was eventually dismissed as part of a comprehensive settlement in 1986.

Beginning in the mid-1970s, Louisiana Avenue and a storm sewer system were constructed through the Site and multi-family housing units were constructed in the northern half of the Site. In 1978, the Minnesota Department of Health (MDH) began to analyze water from municipal wells in St. Louis Park and nearby communities for trace concentrations of PAH. The analysis program discovered unexpectedly high concentrations of PAH in six City wells and one well in neighboring Hopkins, causing the wells to be closed between the years 1978 and 1981.

Subsequent legal actions were taken by the federal and state governmental agencies against Reilly under the Resource Conservation Recovery Act (RCRA), Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), and the Minnesota Environmental Response and Liability Act (MERLA). Both the EPA and the MPCA instituted administrative actions against Reilly, pursuant to the respective federal and state Superfund acts, in order to compel Reilly to undertake necessary remedial actions. Following the administrative actions, further negotiations between the EPA, MPCA, City, and Reilly were completed. General agreement was reached in the summer of 1985. However, because of the complex nature of the agreement and the number of parties involved, the effective date of the final agreement was delayed until September 4, 1986. This agreement is embodied in the Consent Decree - Remedial Action Plan (CD-RAP).

1.3. Requirements of the Legal Settlement

Section 7.2 of the CD-RAP requires gradient control and monitoring in the PCJ Aquifer. Specifically, well SLP4 is required to be pumped at 1000 gallons per minute, and wells W401, W402, and W403 are required for monitoring. Gradient control is achieved by pumping well SLP4 in conjunction with well SLP10/15 and the other municipal and private PCJ wells in St. Louis Park. Well W48 is indicated to be an important part of the gradient control system in Section 7.4.2 of the CD-RAP. Because the pumping rate at well W48 has been reduced, the Agencies are requiring gradient control system modifications pursuant to Section 7.4.1.

Section 7.4.1 of the CD-RAP specifies three alternatives for modifying the gradient control system to prevent the further spread of groundwater in the PCJ aquifer that exceeds any of the drinking water criteria defined in CD-RAP Section 2.2. The three alternatives include alteration of specified pumping at existing gradient control wells, installation and operation of additional gradient control wells or returning to service former gradient control wells. A gradient control well is a pumping well that intercepts groundwater moving from upgradient of the well. Thus, operation of a gradient control well placed downgradient of a contaminant source can act to capture the flow from the source and limit the spread of contamination. As such, the CD-RAP provides the objective of the remedial action, as well as a mandate to the Potentially Responsible Parties to control the gradient in the PCJ Aquifer. This FFS evaluates the three alternatives.

In accordance with the remedial action objective stated in the CD-RAP, this FFS is specific to groundwater in the PCJ Aquifer and is not a site-wide Feasibility Study. The PCJ Aquifer remedial action will operate independently of other remedial actions required by the CD-RAP for the purpose of preventing the further spread of contamination. Remedial actions taken at other areas of the Site may, however, influence the duration of this alternative. For example, operating source and gradient control wells in other aquifers, providing treated drinking water, and continuing to monitor groundwater quality may affect the operation of gradient control wells to varying degrees.

1.4. Remedial Action Objectives

The overall objective of monitoring and controlling the PCJ aquifer gradient is to prevent PAH from migrating beyond St. Louis Park, into the City of Edina municipal well system. Applicable or relevant and appropriate requirements (ARARs) for this alternative are defined in the CD-RAP, Sections 2.2 and 2.5:

DRINKING WATER CRITERIA

Parameter	Advisory Level	Drinking Water Criterion
The sum of benzo(a)pyrene and dibenz(a,h)anthracene	3.0 ng/l*	5.6 ng/l*
Carcinogenic PAH	15 ng/l	28 ng/l
Other PAH	175 ng/l	280 ng/l

*Or the lowest concentration that can be quantified, whichever is greater
ng/l means nanograms per liter, or parts per trillion

Since drinking water criteria for PAHs were not developed through the Safe Drinking Water Act regulations, it was necessary to develop these criteria for PAH compounds. This was accomplished through consultations with experts, MDH, MPCA, and U.S. EPA Drinking Water Program representatives (U.S. EPA, 1986). The drinking water criteria for carcinogenic PAH represents a risk level of 10^{-6}.

The Clean Water Act (CWA) and the regulations under it are applicable to the proposed remedial activities with respect to the discharge of extracted groundwater, or contaminated surface water from the Site, to either the surface waters or the sanitary sewers. The CWA and its regulations promulgate requirements for point source discharges that designate minimum treatment technology standards and protect the quality of the receiving water. The conditions in the CD-RAP are intended to require full compliance with the CWA with regard to National Pollutant Discharge Elimination System (NPDES) permitting and pretreatment requirements.

The operation of the PCJ Aquifer gradient control well will be governed by the use of these ARARs or other limits established by the Agencies. The surface water criteria may be used to assess the discharge options for groundwater that is removed.

SURFACE WATER CRITERIA

Parameter	Daily Maximum Concentration	30-Day Average Concentration
Carcinogenic PAH	--	65 ng/l
Other PAH	34 ug/l	17 ug/l
Phenanthrene	2 ug/l	1 ug/l
Phenols	--	10 ug/l
ug/l means micrograms per liter, or parts per billion		

2.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

2.1. Introduction

The three alternatives to be considered in this FFS are identified in the Agencies' November 2, 1999, letter. Therefore, the technology screening is not required to determine remedial alternatives. The purpose of this section is to document the development of the remedial alternatives. A list of technology types and process options is presented. Those technologies and process options are then briefly evaluated for each of the remedial alternatives.

2.2. Screening of Remedial Technologies

Remedial technology types and specific process options for the three identified alternatives for gradient control in the PCJ Aquifer are listed in Table 2-1. Each of these technologies is described below in terms of technical feasibility and implementability for the remedial alternatives identified by the Agencies. Summary comments of the evaluation are included on Table 2-1, as well as an indication of whether the technology was screened out or retained for further evaluation.

2.2.1. No Action

No action is a baseline to which other remedial technologies can be compared. It is required by the National Contingency Plan (NCP), however since this FFS focuses on three identified alternatives as required by the Agencies' November 2, 1999, letter, the No Action alternative is not an option, and is not further evaluated.

2.2.2. Groundwater Monitoring, Sentry Well

Groundwater monitoring will be included as part of all remedial alternatives. Monitoring is necessary for tracking the presence and movement of contaminants in groundwater, as well as for assessing the effectiveness of remedial actions. Part of the groundwater-monitoring network for all of the alternatives evaluated for this study involves the use of a sentry well. This well will be located between the proposed gradient control wells, and the City of Edina well field. The sentry well will detect PAH that has migrated beyond the gradient control system, before it moves into the Edina wells. The sentry well will serve as an early warning system, and will provide laboratory analytical data to indicate the need for, and timing of, modifying the PCJ gradient control system. For example, if the concentration of PAH at the sentry well exceeds the drinking water criteria,

TABLE 2-1

Initial Technology Screening
PCJ FFS
Reilly Tar and Chemical Corporation NPL Site, St. Louis Park, Minnesota

Technology Type	Process Option	Description	Screening Comments	Selected for Alternative Assembly?
No Action	No Action	No Action	Since Agencies identified the three alternatives, the no action alternative was not evaluated.	No
Groundwater Monitoring	Sentry Well and Aquifer-wide Groundwater Monitoring	Sampling and analysis to track concentrations of compounds. Sentry well provides an early warning of PAH migrating toward Edina.	Is included as part of each remedial alternative.	Yes
Containment	Gradient Control Well	Groundwater extracted through a well located downgradient of the Reilly Site.	Is included as part of each remedial alternative.	Yes
Treatment	Carbon Adsorption	Extracted groundwater pumped through activated carbon to resource contaminants prior to discharge.	Treatment of extracted groundwater may be required prior to discharge to surface water and would be required prior to discharge to City water. Treatment would not be required if extracted groundwater were discharged to Publicly Operated Treatment Works (POTW).	Yes
Disposal	Discharge to POTW	Discharge of extracted groundwater through sanitary sewer to POTW, in this case, a Metropolitan Council of Environmental Services (MCES) facility, for treatment.	Is included as part of each remedial alternative.	Yes
	Discharge to Surface Water	Discharge of extracted groundwater to surface water via storm sewers.	Is included as part of each remedial alternative. Extracted groundwater may require carbon adsorption treatment, prior to discharging.	Yes
	Discharge to City Water	Discharging to the City Water Distribution System	Is included as part of each remedial alternative. Extracted groundwater will require carbon adsorption treatment..	Yes

then pumping the additional gradient control well should begin.

2.2.3. Gradient Control Wells

Gradient control wells are groundwater extraction wells that are designed to prevent contaminants from migrating from an area. All three identified alternatives utilize the gradient control well technology. All three alternatives will effectively intercept groundwater flowing towards the Edina well field. The selected alternative will extract groundwater from the PCJ at a specified rate estimated to be between 500 and 1,000 gpm. The disposal options for the extracted groundwater are discussed below in Section 2.2.5 through 2.2.7.

2.2.4. Carbon Adsorption

Carbon adsorption is a treatment technology that uses activated carbon to remove contaminants from water. Groundwater extracted is pumped through beds of activated carbon and the contaminants adsorb to the carbon. The contaminants are destroyed off site during regeneration of the carbon by thermal treatment.

Carbon adsorption may be required for treatment of groundwater removed from the aquifer prior to discharging to surface water to meet the discharge criteria. A second option for extracted groundwater after carbon adsorption is to discharge the water to the City's water supply system. Carbon treatment at well W48 is not as feasible due to the lack of room at the hospital to install a granular activated carbon system.

2.2.5. Discharge to POTW

Groundwater removed from the aquifer through the gradient control well must be discharged somewhere. Groundwater pumped from wells may be discharged to the local publicly owned treatment works (POTW), which, for the City, is the Metropolitan Council Environmental Services (MCES) facility. Extracted groundwater is pumped to a sanitary sewer, where it flows to the POTW for treatment. Although typically not a long-term option, this technology is useful for initial discharges of extracted groundwater. Therefore, this technology was evaluated for the three identified remedial alternatives.

2.2.6. Discharge to Surface Water

This technology utilizes natural surface water drainage features, such as Minnehaha Creek, to convey the water pumped from the gradient control well. Discharge to surface water, typically through a storm sewer, requires that surface water discharge criteria be achieved. In order to demonstrate compliance with these criteria, it may be necessary to pump the well(s) for some period of time and discharge to a POTW until analytical trends can be determined. If extracted groundwater exceeds the surface water criteria, carbon adsorption can be used to remove contaminants. Discharge to surface water is an acceptable long-term discharge option. Therefore, this technology was evaluated for the three identified remedial alternatives.

2.2.7. Discharge to the City Water Distribution System

Groundwater removed from the aquifer can be treated with carbon adsorption to meet drinking water criteria, and then introduced to the City's water distribution system. Groundwater will be treated to meet the drinking water criteria listed in Section 1.4 of this FFS. Discharge to the City's water supply system is an established long-term discharge option.

2.3. Development of Remedial Alternatives

Each of the three identified remedial alternatives utilizes the technology of an extraction well. There are three technologies for disposition of the extracted groundwater. Each of the alternatives can use one or a combination of technologies to dispose of the extracted groundwater. In addition, groundwater monitoring is a component of all three alternatives. The assembly of remedial alternatives and technologies is presented in Table 2-2.

A detailed description of each alternative and the detailed analysis of the alternatives are presented in Section 3.0.

TABLE 2-2

Assembly of Remedial Alternatives
Prairie du Chien/Jordan Aquifer
Reilly Tar and Chemical Corporation NPL Site, St. Louis Park, Minnesota

Technology/Process Option	Remedial Alternatives		
	(1) Reestablish Pumping at W48	(2) Install a New Gradient Control Well	(3) Establish Full-Time Pumping at SLP6
Groundwater Monitoring	X	X	X
Gradient Control Well	X	X	X
Discharge to Surface Water	X	X	X
Treatment by Carbon Adsorption[a]	X	X	X
Discharge to POTW	X	X	X
Discharge to City Water	X	X	X

a Carbon adsorption will be used only if necessary for achieving surface water criteria on drinking water criteria

3.0 DETAILED ANALYSIS OF ALTERNATIVES

The detailed evaluation of remedial alternatives follows the development of alternatives and precedes the final selection of a remedial alternative. The results of the detailed evaluation provide the basis for identification of a preferred alternative and for preparation of a proposed remediation plan. The detailed evaluation includes:

- A detailed description of each alternative, including the various technologies that make up the alternative, any performance requirements associated with those technologies, and the logic behind application of such an alternative

- An evaluation of each alternative against the detailed set of evaluation criteria

- A comparative analysis of the alternatives to assess the relative performance of each alternative with respect to the detailed evaluation criteria and the conditions at the Site

The evaluation criteria used to conduct the detailed analysis are first presented below.

3.1. Overview of Evaluation Criteria

The detailed analysis of alternatives was performed in accordance with the *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (U.S. EPA 1988) and Section 300.430(e)(9) of the NCP. The purpose of the detailed analysis of alternatives is to provide decision-makers with sufficient information to adequately compare the alternatives and select an appropriate remedy for the Site. The nine evaluation criteria for selection of a remedy that are outlined in Section 300.430(e)(9)(iii) of the NCP are categorized into three groups:

- **Threshold Criteria**

  - Overall protection of human health and the environment

  - Compliance with ARARs [unless a specific ARAR is waived in accordance with Section 300.430(f)(1)(ii)(c) of the NCP]

- **Primary Balancing Criteria**

  - Long-term effectiveness and permanence

- Reduction of toxicity, mobility, or volume through treatment
- Short-term effectiveness
- Implementability
- Cost

- **Modifying Criteria**

  - State acceptance
  - Community acceptance

The nine evaluation criteria to be used in the detailed analysis of alternatives are listed in Table 3-1. The following sections present a detailed description of each alternative and a detailed analysis, using these evaluation criteria.

3.2. Alternative 1: Re-establish Pumping at Well W48

3.2.1. Detailed Description

This alternative includes the use of a sentry well to provide analytical data on which to base a decision to commence pumping in well W48. Well W48 is located in the boiler room of Methodist Hospital, (see Figure 3-1) and is currently used on a limited basis for lawn and garden watering. The well is 20 inches in diameter and is installed to a depth of 485 feet. Reportedly, this well is equipped with a submersible pump capable of achieving approximately 450 gallons per minute (gpm). Based upon historical pumping data, this well is capable of sustaining a pumping rate of at least 750 gallons a minute. Well W48 was originally installed for the purpose of supplying cooling water to the hospital and as such was mostly used during the warmer months (i.e. April through October). The once-through cooling water was discharged directly to Minnehaha Creek under an NPDES permit. The use of well W48 for cooling water supply was discontinued in 1991.

The following tasks have been identified as part of Alternative 1 to use well W48 as a gradient control well:

1. Complete the installation and/or refurbishment of a PCJ Aquifer monitor well (sentry well) located between the area impacted by PAH in St. Louis Park and the closest Edina municipal well. Candidate monitor well locations are shown in Figure 3-2.

2. Monitor the sentry well on a quarterly basis to determine if PAH above the drinking water criteria are migrating towards Edina.

TABLE 3-1

Summary of Detailed Evaluation Criteria

Criteria		Issues
Overall Protection of Human Health and the Environment	-	Protection of human health and the environment
Compliance with ARARs	-	Compliance with Chemical-specific ARARs
	-	Compliance with action-specific ARARs
	-	Compliance with location-specific ARARs
	-	Compliance with other criteria, advisories, and guidance
Long-Term Effectiveness and Performance	-	Magnitude of residual risk
	-	Adequacy and reliability of controls
Reduction of Toxicity, Mobility, and Volume Through Treatment	-	Treatment process used and materials treated
	-	Amount of hazardous materials destroyed or treated
	-	Degree of expected reductions in toxicity, mobility, and volume
	-	Degree to which treatment is irreversible
	-	Type and quantity of residuals remaining after treatment
Short-Term Effectiveness	-	Protection of community during remedial actions
	-	Protection of workers during remedial actions
	-	Environmental impacts
	-	Time until remedial action objectives are achieved
Implementability	-	Ability to construct and operate the technology
	-	Reliability of the technology
	-	Ease of undertaking additional remedial actions, if necessary
	-	Ability to monitor effectiveness of remedy
	-	Ability to obtain approval from other agencies
	-	Coordination with other agencies
	-	Availability of off-site treatment, storage, and disposal services and capacities
	-	Availability of necessary equipment and specialists
	-	Availability of prospective technologies
Cost	-	Initial costs
	-	Operating and maintenance costs
	-	Present worth costs
State Acceptance[1]	-	State acceptance of preferred alternative
Community Acceptance[1]	-	Community acceptance of preferred alternative

1. State and community acceptance criteria are addressed in the Record of Decision following public comment on the Feasibility Study.

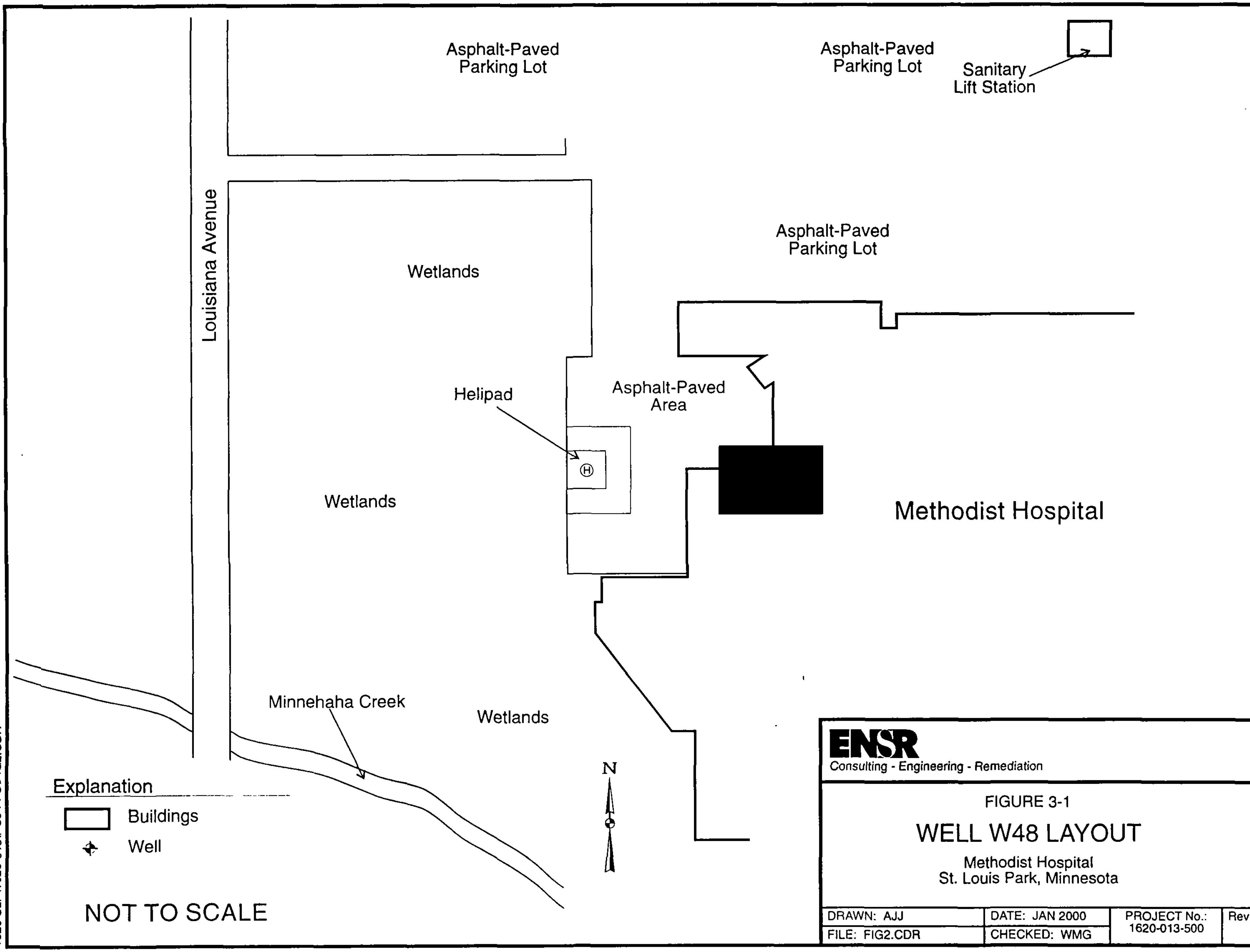

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FIGURE 3-1

WELL W48 LAYOUT

Methodist Hospital
St. Louis Park, Minnesota

DRAWN: AJJ	DATE: JAN 2000	PROJECT No.: 1620-013-500	Rev:
FILE: FIG2.CDR	CHECKED: WMG		

1620 SLP\1620-013\PCJ FFS\FIG2.CDR

3. If monitoring indicates that PAH are migrating towards Edina, pull the existing pump from well W48 and provide a new pump capable of pumping up to 1,000 gpm. This task would also involve any other down-hole well maintenance activities to ensure efficient well operations until the next regularly scheduled well maintenance data (once every 10 years). When does pumping start

4. Construct the well head with connection to a storm (or sanitary) sewer, flow controls and recorder, sample collection tap, dedicated utilities, and a connection to the Hospital's irrigation system for continued use for lawn and garden watering.

5. Construct storm sewer from the well head, across the paved area (parking and helipad) west of the hospital building, and into Minnehaha Creek (Figure 3-1). The total distance involved is approximately 300 feet.

The above tasks assume a surface water discharge for well W48, consistent with historical operations. However, it is not known if a new discharge into Minnehaha Creek can be successfully permitted (the City was unsuccessful in obtaining a surface water discharge for well SLP4). Therefore, to be consistent with the discharge options for Alternatives 2 and 3, there are three options of where to discharge the extracted groundwater from well W48:

1. Discharge to the sanitary sewer
2. Discharge to the surface water
3. Discharge to the City's water distribution system

Discharging to the surface water may require pre-treatment using carbon. Discharging to the City's water supply system would require carbon treatment. It is unlikely that adequate space is available in the Methodist Hospital building or in the surrounding area, to construct water treatment facilities.

only discharge to san sewer

Included in this alternative is continued water level and water quality monitoring to assess the impacts of modifying the PCJ gradient control system. Sampling would be conducted in accordance with the Site Sampling Plan.

3.2.2. Detailed Analysis

3.2.2.1. Overall Protection of Human Health and the Environment

Monitoring groundwater samples from the sentry well in conjunction with ongoing PCJ Aquifer monitoring of the many municipal supply wells in St. Louis Park and Edina, will provide the analytical data to protect the Edina well field from PAH migrating from St. Louis Park. This alternative would provide protection of human health and the environment by limiting the further spread of contaminants in the PCJ Aquifer, if necessary. It is expected the capture zone created by the pumping of well W48, in combination with wells SLP10/15 and SLP4, will prevent contaminated water from entering the Edina well field.

3.2.2.2. Compliance with ARARs

This alternative is expected to comply with all ARARs. Applicable or relevant and appropriate requirements for this alternative are defined in the CD-RAP, Sections 2.2 and 2.5. Depending on the disposal option chosen for water pumped from well W48, the water will need to meet the drinking water or surface water criteria described previously in Section 1.4, or be discharged to the sanitary sewer. Permits that may be required for this alternative include:

- DNR water appropriation permit   Drinking water criteria
- Local building/construction permits
- MCES discharge permit
- NPDES/SDS permit

3.2.2.3. Long Term Effectiveness and Permanence

Monitoring the PAH concentration in the sentry well will provide an effective early warning for PAH migration toward the Edina well field. Groundwater monitoring will be conducted for as long as necessary to ensure protection of the Edina wells.

Pumping at well W48 will be effective in limiting the further spread of contaminants in the PCJ Aquifer and prevent contaminated water from entering the Edina well field.

Residual levels of PAH will remain in the aquifer. Based on their relatively large volume and low mobility, residual PAH are expected to remain in the aquifer for at least the 30-year life of the CD-RAP. Pumping will continue as long as it is necessary to attempt to prevent the further spread of contamination.

There are three discharge options for Alternative 1, re-establishing pumping at well W48. One option is to discharge extracted groundwater to the sanitary sewer for treatment by the MCES, which is very effective in removing PAH. A second option is to discharge the extracted groundwater to surface water provided that all effluent limitations set by the CD-RAP or NPDES/SDS permits are met. To reach the effluent limitations, the discharge may need to be treated using activated carbon, although the PAH concentration in the raw well water is expected to be lower than the amount of PAH in typical urban runoff. The third option is to discharge the extracted groundwater to the City's water supply system after being treated with activated carbon. When the activated carbon is no longer effective to treating the discharge, it will be replaced with new activated carbon. The spent carbon will then become a treatment residual and would be disposed of in conjunction with spent carbon generated at other treatment facilities. Spent carbon from the SLP10/15 drinking water treatment plant has been evaluated for acute toxicity by the City, under guidance provided by the MPCA Hazardous Waste Division, and was found not to be toxic. The carbon generated from other plants treating gradient control water is expected to be similar. Therefore, no significant additional risk from spent carbon is anticipated.

The pumping technology for this alternative is standard, reliable, and a proven technology for meeting project objectives. System components may require replacement during the life of this remedial action. The replacement of components may interfere with hospital activities but should be straightforward. The City has been operating and maintaining groundwater-pumping systems for over 40 years, thus no problems with the adequacy or reliability of controls is anticipated.

3.2.2.4. Reduction of Toxicity, Mobility, or Volume Through Treatment

The most important feature of this alternative is the control exerted by the pumping well on the volume and mobility of contaminants within the aquifer. During the course of pumping, the more mobile PAH will be removed first, leaving less mobile PAH in the aquifer.

Reduction of contaminants in the groundwater is not a principal element of this alternative. The actual mass removal of contaminants in the pumped groundwater would only destroy a relatively small portion of the total volume of contamination.

3.2.2.5. Short Term Effectiveness

The sentry well can be installed with a short period of time, consistent with wells W402 and W403 which are PCJ Aquifer monitor wells installed for the CD-RAP. Given the laboratory turnaround time, data should be available within a couple of months after an alternative is selected. The further spread of contamination in the capture zone of the pumping well will be halted within a short time period. It is expected that extracting groundwater from this well will prevent contaminated water from entering the Edina well field.

The construction and implementation phase of this alternative presents minimal worker exposure and community exposure, and will not cause adverse environmental impacts. The well and housing for the well are already in existence. The City would need to develop an access agreement with Methodist Hospital prior to the construction phase.

The need for additional response actions in the PCJ Aquifer will be addressed based on future groundwater monitoring results. Monitoring of available wells completed in the PJC Aquifer is ongoing.

3.2.2.6. Implementability

There are no implementability issues for the sentry well. The candidate sentry well locations presented in Figure 3-2 are all on city-owned property. There are a range of implementability issues if well W48 needs to be pumped as a gradient control well, as discussed below.

If well W48 can be pumped and either directly discharged to Minnehaha Creek without treatment (through the wetlands west of the hospital), or routed to the sanitary sewer (through a connection made at the lift station on the north side of the hospital's northern parking lot), implementability problems can be minimized. The City would need the assistance and cooperation of Methodist Hospital to allow this activity, and an access agreement would be needed to permit on-going operation and maintenance (O&M) activities. It is assumed that the hospital would still need some of the water for irrigation purposes, and that the City would be responsible for all permitting and O&M.

If treatment were needed to meet surface or drinking water discharge criteria, then there would be serious implementability problems with Alternative 1. The floor space in the hospital building is limited, and is used by the hospital. Adjacent areas outside the building include service/delivery areas, cancer patient parking, and a helicopter-landing pad. It would be possible, although costly, to pump the discharge water southeast approximately 2,800 feet to a treatment facility located at well SLP6. An alternate location may be possible in the hospital's northern parking lot, although the hospital cannot afford to lose more parking spaces. The treatment facilities would be constructed much like the GAC plants currently used by the City for treating source control well discharge. Using the discharge for drinking water supply would be more difficult, because of the need to connect to the distribution system at a water reservoir where the water can be effectively distributed. The nearest water reservoir is located at well SLP6.

The technology for pumping groundwater is reliable, and easy to maintain. There should be little potential for schedule delays, or conflicts with other remedial actions taken at the Site. Groundwater monitoring, and monitoring the discharge from the pumping wells, will provide an adequate means of assessing exposure pathways. Repair work on system components will be similarly straightforward; however, repair work may interfere with hospital activities. Methodist Hospital may or may not be amenable to granting access to well W48, but for the purpose of this FFS, it is assumed they would be cooperative.

Administrative agencies are not expected to present infeasible implementation problems. The same remedial actions are currently being practiced elsewhere at the Reilly Site. However, agencies such as the MCES, Minnesota Department of Natural Resources (DNR), and/or Minnehaha Creek Watershed District may provide some barriers to implementation. The DNR would rather see a resource such as groundwater utilized for some benefit rather than just wasting the groundwater to the sewer. The DNR and Minnehaha Creek Watershed District may not favor discharging to the storm sewer, which discharges to Minnehaha Creek. These agencies may prefer if the groundwater was utilized for drinking. The watershed district is responsible for maintaining the flow in Minnehaha Creek and during times of floods or high water it may not be desirable to have "extra" water being discharged into the creek. MCES would also prefer not to use its hydraulic capacity to treat an essentially clean water discharge, although it would be lucrative for them.

Services and materials for this work are all available at competitive bid prices, and will not limit the implementability of this alternative.

3.2.2.7. Costs

For the purpose of this study, it is assumed that the sentry well will be installed immediately, and costs are calculated for construction and operation and maintenance of well W48 from the year 2001 through the end of the Consent Decree in the year 2016. The remedial design will present a detailed schedule for the work, and, it may not be possible to begin pumping well W48 as early as 2001. Also, it will not be necessary to pump well W48 until monitoring data from the sentry well indicate PAH are migrating to Edina. This is not expected to occur in the near future; nonetheless, all three alternatives are estimated assuming 15 years of operation and maintenance.

Because of the relatively short, 15-year timeframe the well is assumed to be operating, and the City's experience in the last 15 years of increased monitoring and pumping costs, no discount was calculated for future costs spent to implement any of the alternatives. Sanitary sewer charges, monitoring fees, utility costs, and other O&M costs are calculated on an annual basis and simply multiplied by the 15-year project duration. This should give adequate comparison of costs between alternatives.

The estimated costs for Alternative 1 is presented in Table 3-2. The raw construction cost to install the sentry well is estimated to be $30,000. This well would fully penetrate the PCJ Aquifer and would be constructed similar to wells W402 and W403. Table 3-2 show contingencies added to the raw (total) construction costs, including 20% for remedial design, 18% for remedial construction oversight, and an additional 30% contingency. These contingencies bring the cost of

TABLE 3-2

ESTIMATED COSTS OF ALTERNATIVE 1

Re-establishing pumping at the Methodist Hospital Well W48

			Alternative 1 A Surface water discharge, No treatment			Alternative 1 B Surface water discharge with treatment			Alternative 1 C Sanitary sewer water discharge			Alternative 1D Drinking water		
Item Description	**Unit**	**# Units**	**Unit Cost ($)**	**Subtotal**	**Item Total ($)**	**Unit Cost ($)**	**Subtotal**	**Item Total ($)**	**Unit Cost ($)**	**Subtotal**	**Item Total ($)**	**Unit Cost ($)**	**Subtotal**	**Item Total ($)**
INSTALL SENTRY WELL				$30,000	$30,000		$30,000	$30,000		$30,000	$30,000		$30,000	$30,000
Mobilization	LS	1	$5,000	$5,000		$5,000	$5,000		$5,000	$5,000		$5,000	$5,000	
Well Installation	LS	1	$25,000	$25,000		$25,000	$25,000		$25,000	$25,000		$25,000	$25,000	
RE-ESTABLISHING WELL				$125,250	$125,250		$125,250	$125,250		$125,250	$125,250		$125,250	$125,250
Site Access	LS	1	$100,000	$100,000		$100,000	$100,000		$100,000	$100,000		$100,000	$100,000	
Pump	LS	1	$14,000	$14,000		$14,000	$14,000		$14,000	$14,000		$14,000	$14,000	
Drop Pipe	LF	45	$250	$11,250		$250	$11,250		$250	$11,250		$250	$11,250	
SURFACE WATER DISCHARGE				$58,900	$58,900		$58,900	$58,900						
Connection	LS	1	$5,000	$5,000		$5,000	$5,000							
Piping	LF	300	$13	$3,900		$13	$3,900							
Permitting	LS	1	$50,000	$50,000		$50,000	$50,000							
SANITARY SEWER DISCHARGE										$6,329,070	$6,329,070			
Connection	LS	1							$5,000	$5,000				
Piping	LF	1100							$15	$16,500				
Permitting	LS	1							$1,000	$1,000				
Sewer access charge	LS	1							$6,306,570	$6,306,570				
CITY DISTRIBUTION SYSTEM													$56,400	$56,400
Connection	LS	1										$5,000	$5,000	
Piping	LF	2800										$18	$50,400	
Permitting	LS	1										$1,000	$1,000	
TREATMENT							$2,080,000	$2,080,000					$2,080,000	$2,080,000
GAC unit and building	LS	1				$2,000,000	$2,000,000					$2,000,000	$2,000,000	
Carbon	LS	1				$80,000	$80,000					$80,000	$80,000	
Total Construction Costs (TCC):					*$214,150*			*$2,294,150*			*$6,484,320*			*$2,291,650*
Design (20% TCC)					$42,830			$458,830			$1,296,864			$458,330
Oversight (18% TCC)					$38,547			$412,947			$1,167,178			$412,497
Contingency (30% TCC)					$64,245			$688,245			$1,945,296			$687,495
TCC with Contingencies					**$359,772**			**$3,854,172**			**$10,893,658**			**$3,849,972**
ANNUAL O & M				$33,340	$33,340		$73,340	$73,340		$650,260	$650,260		$63,340	$63,340
Electricity	LS	1	$9,000	$9,000		$9,000	$9,000		$9,000	$9,000		$9,000	$9,000	
Labor	HR	124	$35	$4,340		$35	$4,340		$35	$4,340		$35	$4,340	
Carbon replacement	LS	1				$40,000	$40,000					$40,000	$40,000	
Discharge costs	UNIT	526.6							$1,200	$631,920				
Additional lab analyses	LS	1	$20,000	$20,000		$20,000	$20,000		$5,000	$5,000		$10,000	$10,000	
Annual O & M for 15 years					$500,100			$1,100,100			$9,753,900			$950,100
Total Alternative Cost:					**$859,872**			**$4,954,272**			**$20,647,558**			**$4,800,072**

installing the sentry well to approximately $50,000. Annual O&M for the sentry well consists of quarterly sampling, estimated at $4,000 per year. The O&M for 15 years is $60,000. Thus, the estimated cost for the sentry well for each alternative is $110,000.

Table 3-2 shows the estimated costs assuming well W48 is used as a gradient control well, under varying discharge scenarios. Based on prior experience at the Reilly Site, the first year construction costs including equipment, installation, the sentry well, engineering, permits, startup, and contingencies are estimated at $360,000 assuming an untreated, surface water discharge. Annual O&M costs for this alternative would be approximately $33,000, bringing the total cost for this option for 15 years of operation to $860,000.

If the extracted water from well W48 were treated for either surface water discharge, or for use as drinking water supply, the total 15-year costs would increase to approximately $5 million for well W48. Owing to high sanitary sewer discharge rates, and the sewer access charge, discharging to the sanitary sewer would cost over $20 million.

If major equipment problems occur, and replacement is required at some time during the years of operation, then two to four weeks should be sufficient to correct the problem. Given the relatively slow velocity of groundwater travel, no costs for any other remedial actions are included in the above estimates to prevent exposure to contaminants.

3.3. Alternative 2: Install Replacement Well in the Vicinity of Well W48

3.3.1. Detailed Description

This alternative consists of installing a sentry well for groundwater monitoring, and installing a replacement gradient control well in the southern portion of the City to intercept groundwater flowing toward Edina. The new well would be installed to a depth of approximately 450 feet. It is expected this well would have the capacity of 500 to 1,000 gpm. There is also an option to use well W119 as a gradient control well instead of well W48. Well W119 is located approximately 2,200 feet south of well W48, and is owned by the Minneapolis Park Board. Well W119 is 500 feet deep and has 12-inch diameter casing. It was originally used as a high capacity irrigation well for Meadowbrook Golf Course, but has been out of service for the past 10 years. Well W119 is immediately adjacent to Minnehaha Creek (Meadowbrook Lake), and was formerly discharged to the creek, where the golf course extracted the water for irrigation. Because of the availability of well W119, and the general lack of a better location to drill a new well in the vicinity of well W48, the cost estimates for this alternative are based on using well W119.

The following tasks have been identified as part of Alternative 2 to use well W119 as a gradient control well:

1. Complete the installation of a PCJ Aquifer monitor well (sentry well) located between the area impacted by PAH in St. Louis Park and the closest Edina municipal well.

2. Monitor the sentry well to determine if PAH are migrating towards Edina.

3. If monitoring indicates that PAH are migrating towards Edina, pull the existing pump from well W119 and replace it with a new pump capable of pumping 1000 gallons per minute.

4. Assuming surface water discharge, construct the well head with connection to the adjacent surface water, flow controls and recorder, sample collection tap, and dedicated utilities.

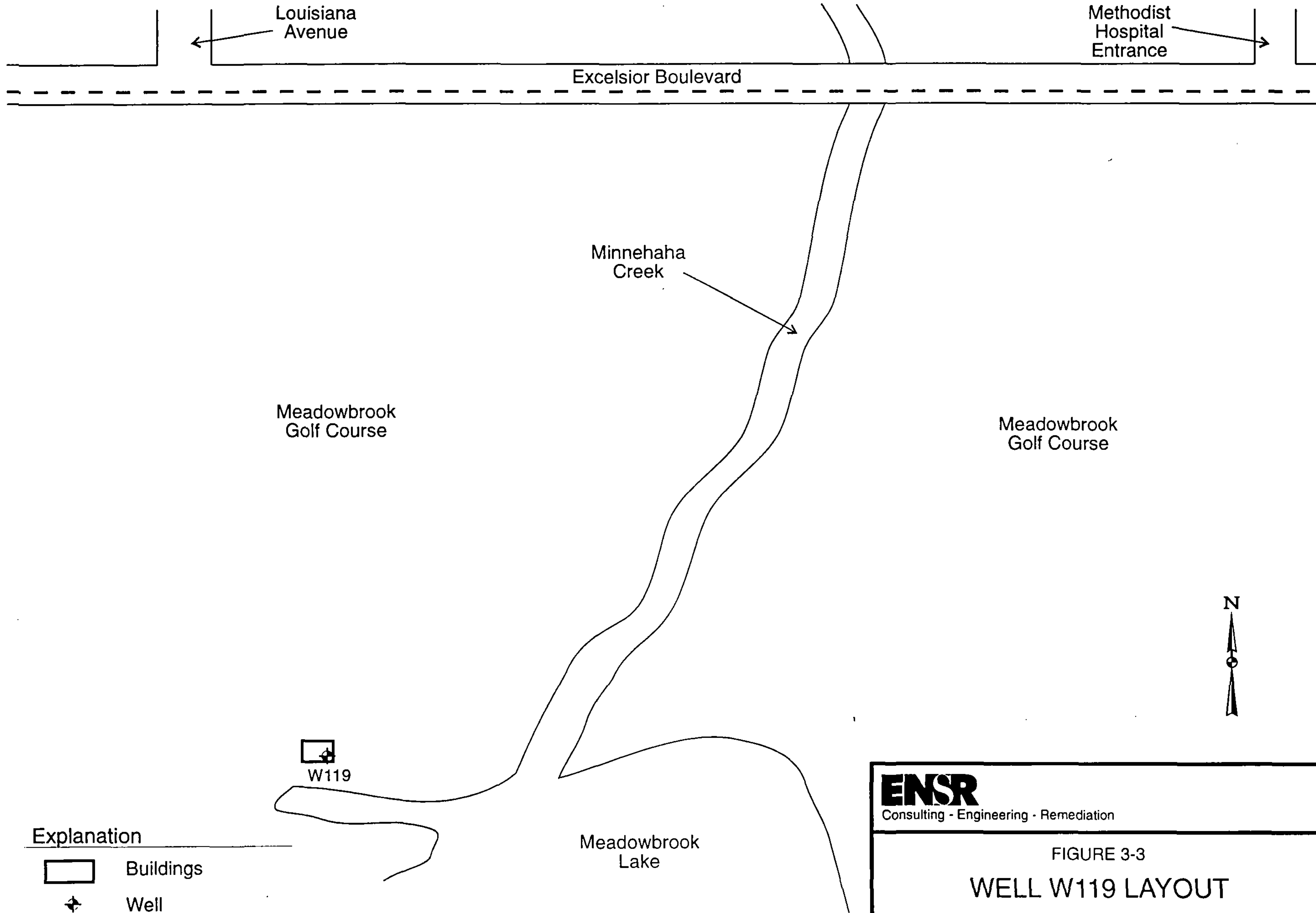
Alternative 2 has the same three options for discharging the extracted groundwater; namely surface water discharge, sanitary sewer discharge, or treating and drinking the water. The surface water discharge would take place adjacent to W119 in Minnehaha Creek (Figure 3-3). The sanitary sewer connection would be constructed along Excelsior Boulevard. If the water were used for drinking, it would be difficult to enter the City's distribution system unless the water was directed to the nearest City water reservoir at well SLP6. This alternative includes the cost of a water main from well W119 to the well SLP6 water reservoir. Included in this alternative is continued water level and water quality monitoring to assess the impacts of modifying the PCJ gradient control system. Sampling would be conducted in accordance with the Site Sampling Plan.

3.3.2. Detailed Analysis

Alternative 2 uses the same gradient control technology as Alternative 1, thus the detailed analysis is much the same. The discussions below highlight any differences between the alternatives, which occur primarily in the options for discharging extracted groundwater.

3.3.2.1. Overall Protection of Human Health and the Environment

This alternative would provide further protection of human health and the environment monitoring and by limiting the further spread of contaminants in the PCJ Aquifer. Pumping at this well would prevent contaminated groundwater from entering the Edina well field.



Explanation

- Buildings
- Well
- Sanitary Sewer

NOT TO SCALE

ENSR
Consulting - Engineering - Remediation

FIGURE 3-3

WELL W119 LAYOUT

Meadowbrook Golf Course
St. Louis Park, Minnesota

DRAWN: AJJ	DATE: JAN 2000	PROJECT No.: 1620-013-500	Rev:
FILE: FIG3.CDR	CHECKED: WMG		

1620 SLP\1620-013\PCJ FFS\FIG3.CDR

3.3.2.2. Compliance with ARARs

Applicable or relevant and appropriate requirements for this alternative are defined in the CD-RAP, Sections 2.2 and 2.5. The ARARs for this alternative are the same as identified in Alternative 1 and are listed in Section 3.2.2.2. It is expected that this Alternative 2 will comply with ARARs.

3.3.2.3. Long Term Effectiveness and Permanence

Monitoring the PAH concentration in the sentry well will provide an effective early warning for PAH migration toward the Edina well field. Groundwater monitoring will be conducted for as long as necessary to ensure protection of the Edina wells.

The pumping at a new PCJ gradient control well will be effective in reducing or limiting the further spread of contamination and prevent contaminated groundwater from entering the Edina well field.

There are no distinguishing differences between the long term effectiveness and permanence between Alternative 1 and Alternative 2. Residual levels of PAH will remain in the aquifer. Based on their relatively large volume and low mobility, residual PAH are expected to remain in the aquifer for at least the 30-year life of the CD-RAP. Pumping will continue as long as it is necessary to attempt to prevent the further spread of contamination.
Discharge options for groundwater extracted from a new well would be the same as the three options identified in Alternative 1 and listed in Section 3.2.2.3.

3.3.2.4. Reduction of Toxicity, Mobility, or Volume Through Treatment

The reduction of toxicity, mobility, or volume through treatment is similar to Alternative 1. No distinguishing differences have been identified and thus the reduction of toxicity, mobility, or volume through treatment are the same as Alternative 1 as discussed in Section 3.2.2.4.

3.3.2.5. Short Term Effectiveness

The sentry well can be installed with a short period of time, consistent with wells W402 and W403 which are PCJ Aquifer monitor wells installed for the CD-RAP. Given the laboratory turnaround time, data should be available within a couple of months after an alternative is selected. This alternative will prevent contaminated water from entering the Edina well field. The well and pump will be constructed so that the pumping rate will be able to be adjusted from 500 to 1,000 gpm so that the capture zone can be expanded or shrunken as necessary. Well W119 already meets this requirement.

The construction and implementation phase of this alternative presents minimal worker exposure and community exposure, and will not cause adverse environmental impacts. This alternative requires construction of a well and well house and the installation of a pump. The options for discharge are the same as those listed in Alternative 1. If well W119 is used, the existing well house is sufficient for both surface water and sanitary sewer discharge options. The well house would need to be rebuilt to accommodate water treatment.

The need for additional response actions in the PCJ Aquifer will be addressed based on future groundwater monitoring.

3.3.2.6. Implementability

If well W119 or a new well can be pumped and discharged directly to surface water without treatment, this alternative would be relatively straightforward to implement. A sanitary sewer connection along Excelsior Boulevard would require additional construction through Meadowbrook Golf Course, and in Excelsior Boulevard, a Hennepin County highway. If the water needs to be treated prior to a surface water discharge, the existing well house would require reconstruction to provide adequate floor space. This is assumed to be feasible through agreement with the Minneapolis Park Board, due to the ample land area available around well W119.

Similar to Alternative 1, if well W119 or a new replacement well was to be used as a drinking water source, a water main would need to be constructed to connect with the water reservoir approximately ½-mile east at well SLP6.

3.3.2.7. Costs

The estimated costs to implement Alternative 2 are presented in Table 3-3. As described for Alternative 1, the estimated cost to install a sentry well and provide 15 years of quarterly monitoring is $100,000. Based on prior experience at the Reilly Site, the first year construction costs including equipment, installation, the sentry well, engineering, permits, startup, and contingencies are estimated at approximately $270,000. Annual O&M costs for this alternative (surface water discharge) would be approximately $33,000, bringing the total cost of this option, for 15 years of operation, to approximately $770,000.

If the extracted water from well W119 was treated for either surface water discharge, or for use as a drinking water supply, the total 15-year costs would increase to approximately $4.9 million and $4.7 million, respectively. The sanitary sewer discharge option would cost over $20 million.

TABLE 3-3

ESTIMATED COSTS OF ALTERNATIVE 2

Install a Replacement Well in the Vicinity of W48
Pump from W119

			Alternative 2 A Surface water discharge, No treatment			Alternative 2 B Surface water discharge with treatment			Alternative 2 C Sanitary sewer water discharge			Alternative 2D Drinking water		
Item Description	**Unit**	**# Units**	**Unit Cost ($)**	**Subtotal**	**Item Total ($)**	**Unit Cost ($)**	**Subtotal**	**Item Total ($)**	**Unit Cost ($)**	**Subtotal**	**Item Total ($)**	**Unit Cost ($)**	**Subtotal**	**Item Total ($)**
INSTALL SENTRY WELL				$30,000	$30,000		$30,000	$30,000		$30,000	$30,000		$30,000	$30,000
Mobilization	LS	1	$5,000	$5,000		$5,000	$5,000		$5,000	$5,000		$5,000	$5,000	
Well Installation	LS	1	$25,000	$25,000		$25,000	$25,000		$25,000	$25,000		$25,000	$25,000	
RE-ESTABLISHING WELL W119				$75,250	$75,250		$75,250	$75,250		$75,250	$75,250		$75,250	$75,250
Site Access	LS	1	$50,000	$50,000		$50,000	$50,000		$50,000	$50,000		$50,000	$50,000	
Pump Replacement	LS	1	$14,000	$14,000		$14,000	$14,000		$14,000	$14,000		$14,000	$14,000	
Drop Pipe	LF	45	$250	$11,250		$250	$11,250		$250	$11,250		$250	$11,250	
SURFACE WATER DISCHARGE				$56,950	$56,950		$56,950	$56,950						
Connection	LS	1	$5,000	$5,000		$5,000	$5,000							
Piping	LF	150	$13	$1,950		$13	$1,950							
Permitting	LS	1	$50,000	$50,000		$50,000	$50,000							
SANITARY SEWER DISCHARGE										$6,332,070	$6,332,070			
Connection	LS	1							$5,000	$5,000				
Piping	LF	1300							$15	$19,500				
Permitting	LS	1							$1,000	$1,000				
Sewer access charge	LS	1							$6,306,570	$6,306,570				
CITY DISTRIBUTION SYSTEM													$56,400	$56,400
Connection	LS	1										$5,000	$5,000	
Piping	LF	2800										$18	$50,400	
Permitting	LS	1										$1,000	$1,000	
TREATMENT							$2,080,000	$2,080,000					$2,080,000	$2,080,000
GAC unit and building	LS	1				$2,000,000	$2,000,000					$2,000,000	$2,000,000	
Carbon	LS	1				$80,000	$80,000					$80,000	$80,000	
Total Construction Costs (TCC):					*$162,200*			*$2,242,200*			*$8,437,320*			*$2,241,650*
Design (20% TCC)					$32,440			$448,440			$1,287,464			$448,330
Oversight (18% TCC)					$29,196			$403,596			$1,158,718			$403,497
Contingency (30% TCC)					$48,660			$672,660			$1,931,196			$672,495
TCC with Contingencies					**$272,496**			**$3,766,896**			**$10,814,698**			**$3,765,972**
ANNUAL O & M				$33,340	$33,340		$73,340	$73,340		$650,260	$650,260		$63,340	$63,340
Electricity	LS	1	$9,000	$9,000		$9,000	$9,000		$9,000	$9,000		$9,000	$9,000	
Labor	HR	124	$35	$4,340		$35	$4,340		$35	$4,340		$35	$4,340	
Carbon replacement	LS	1				$40,000	$40,000					$40,000	$40,000	
Discharge costs	UNIT	526.6							$1,200	$631,920				
Additional lab analyses	LS	1	$20,000	$20,000		$20,000	$20,000		$5,000	$5,000		$10,000	$10,000	
Annual O & M for 15 years					$500,100			$1,100,100			$9,753,900			$950,100
Total Alternative Cost:					**$772,596**			**$4,866,996**			**$20,568,598**			**$4,716,072**

3.4. Alternative 3: Establish Full Time Pumping at SLP6

3.4.1. Detailed Description

This alternative consists of installing a sentry well to serve as an early warning system, and, based on water quality results, resume pumping at SLP6. It is expected that SLP6 will pump at a range of 500 to 1,000 gpm. Pumping at SLP6 will create sufficient capture to prevent contaminated groundwater from entering the Edina well field

The following tasks have been identified as part of Alternative 3 to use well SLP6 as a gradient control well:

1. Complete the installation of a PCJ Aquifer monitor well (sentry well) located between the area impacted by PAH in St. Louis Park and the closest Edina municipal well

2. Monitor the sentry well to determine if PAH are migrating towards Edina

3. If monitoring indicates that PAH are migrating towards Edina, begin pumping well SLP6 at 500 to 1000 gallons per minute

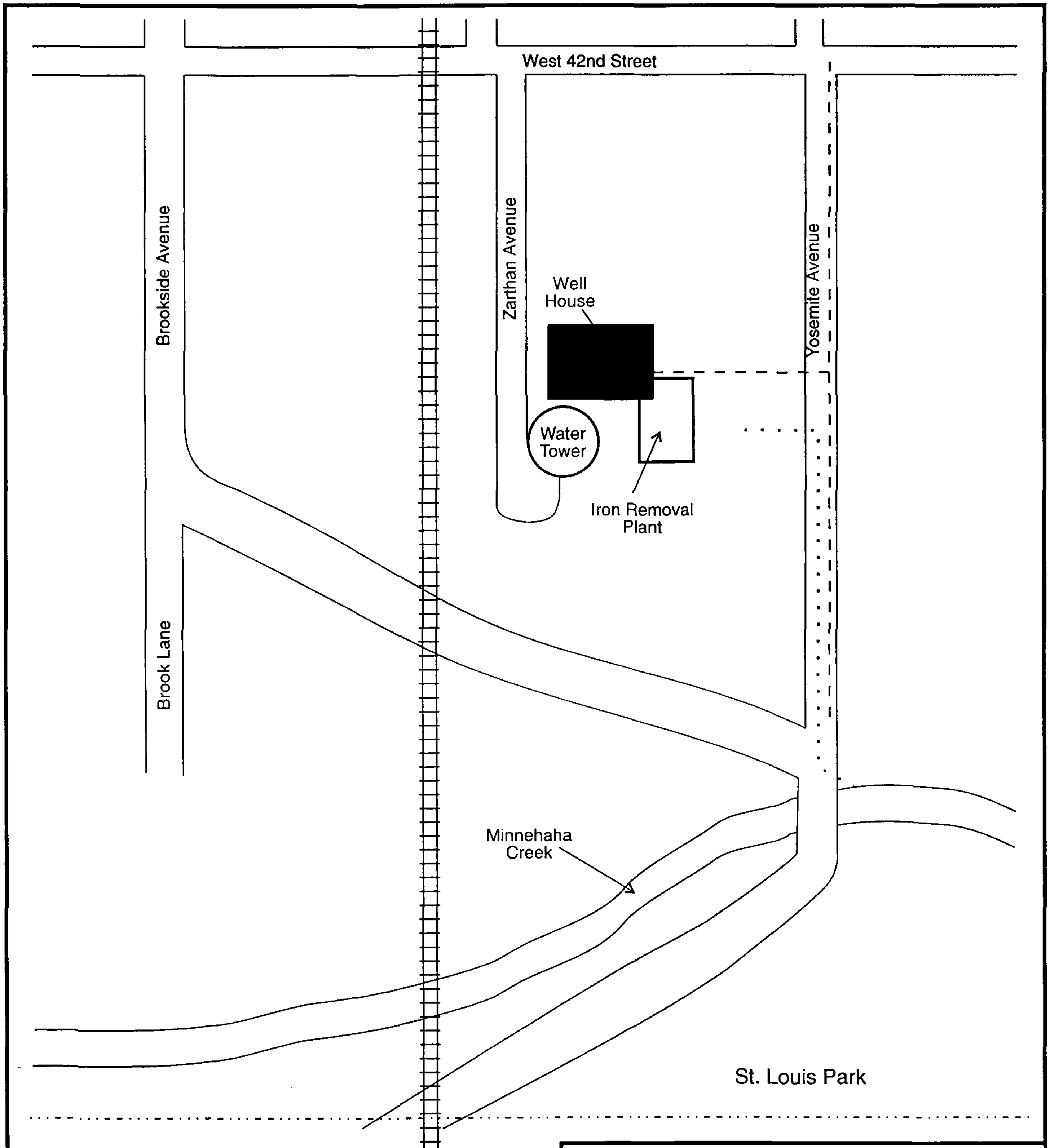
The three options for discharging the extracted groundwater are the same for Alternative 3 as for the two previous alternatives. Both surface water and sanitary sewer connections are currently available at well SLP6. An iron-removal plant is currently located at well SLP6 (Figure 3-4). drinking water treatment would require a reconstructed treatment plant with GAC.

Also, included in this alternative is continued water level and water quality monitoring to assess the impacts of modifying the PCJ gradient control system. Sampling would follow the Site Sampling Plan.

3.4.2. Detailed Analysis

3.4.2.1. Overall Protection of Human Health and the Environment

This alternative would provide further protection of human health and the environment by monitoring and limiting the further spread of contaminants in the PCJ Aquifer. Pumping at this well would prevent contaminated groundwater from entering the Edina well field.



Explanation

- Buildings
- Well
- Sanitary Sewer
- Storm Sewer

NOT TO SCALE

ENSR
Consulting - Engineering - Remediation

FIGURE 3-4

WELL SLP6 LAYOUT

SLP6 Water Tower
St. Louis Park, Minnesota

DRAWN: AJJ	DATE: JAN 2000	PROJECT No.: 1620-013-500	Rev:
FILE: FIG4.CDR	CHECKED: WMG		

1620 SLP\1620-013\PCJ FFS\FIG4.CDR

3.4.2.2. Compliance with ARARs

Groundwater discharged from SLP6 would comply with ARARs. Applicable or relevant and appropriate requirements for this alternative are defined in the CD-RAP, Sections 2.2 and 2.5. The ARARs for this alternative are the same as those for Alternative 1 and Alternative 2 and are listed in Section 3.2.2.2.

3.4.2.3. Long Term Effectiveness and Permanence

The sentry well would be an effective means to assess contaminant spreading in the PCJ Aquifer. The pumping at SLP6 would be effective in reducing or limiting the further spread of contamination and preventing contaminated groundwater from entering the Edina well field.

Like Alternative 1 and Alternative 2, Alternative 3 will provide long term effectiveness and permanence. Residual levels of PAH will remain in the aquifer. Based on their relatively large volume and low mobility, residual PAH are expected to remain in the aquifer for at least the life of the CD-RAP. Monitoring and/or pumping will continue as long as it is necessary to prevent the further spread of contamination.

Discharge options for groundwater extracted from SLP6 will be the same as the three options identified in Alternative 1 and Alternative 2 and listed in Section 3.2.2.3.

3.4.2.4. Reduction of Toxicity, Mobility, or Volume Through Treatment

The reduction of toxicity, mobility, or volume through treatment is similar to Alternative 1 and Alternative 2. No distinguishing differences have been identified and thus are the same as discussed in Section 3.2.2.4.

3.4.2.5. Short Term Effectiveness

The need for response actions in the PCJ Aquifer will be based on future groundwater monitoring including monitoring of the sentry well. Well SLP6 can be pumped to the sanitary sewer or to storm water without treatment immediately. There is no additional construction period unless treatment is needed.

This alternative as well as Alternative 1 and Alternative 2 will prevent contaminated water from entering the Edina well field. The pumping rate will be able to be adjusted from 500 to 1,000 gpm so that the capture zone can be expanded or shrunken as necessary to prevent contaminated water from entering the Edina well field.

The construction and implementation phase of this alternative presents minimal worker exposure and community exposure, and will not cause adverse environmental impacts. The options for discharge are the same as those listed in Alternative 1 and Alternative 2.

3.4.2.6. Implementability

Since SLP6 and well house are in existence, the implementability of this alternative consists of deciding where the discharge of the extracted groundwater will go, the construction of a GAC system if required, and the necessary permits. No additional implementation problems are associated with this alternative.

3.4.2.7. Costs

The estimated costs for Alternative 3 are presented in Table 3-4. The costs for the sentry well are the same as Alternatives 1 and 2. Based on prior experience at the Reilly Site, first year construction costs including equipment, installation, the sentry well, engineering, permits, startup, and contingencies are estimated at approximately $93,000 for an untreated surface water discharge. Annual O&M costs for Alternative 3 (surface water discharge option) would be approximately $33,000. The total cost of this option, for 15 years of operation, is estimated to be $660,000.

If a GAC treatment facility is required for a surface water disposal option or for use in the City's water supply system, the total 15-year costs would increase to $3.9 million and $3.7 million, respectively.

3.5. Comparative Analysis

Table 3-5 provides a summary of the detailed evaluations for each alternative. The threshold criteria are met by all three alternatives. The major differences in the alternatives involve cost and implementability, primarily based on how extracted water is discharged.

3.5.1. Overall Protection of Human Health and the Environment

All three alternatives would offer similar protection to human health and the environment. All three alternatives would monitor the groundwater to provide an early warning if PAH were actually migrating toward Edina. The use of an additional gradient control well would prevent contaminated groundwater from entering the Edina well field and would offer a buffer zone between the capture area and the Edina well field.

TABLE 3-4

ESTAIMTED COSTS OF ALTERNATIVE 3

Establish full time Pumping at SLP6

			Alternative 3 A Surface water discharge, No treatment			Alternative 3 B Surface water discharge with treatment			Alternative 3 C Sanitary sewer water discharge			Alternative 3D Drinking water		
Item Description	**Unit**	**# Units**	**Unit Cost ($)**	**Subtotal**	**Item Total ($)**	**Unit Cost ($)**	**Subtotal**	**Item Total ($)**	**Unit Cost ($)**	**Subtotal**	**Item Total ($)**	**Unit Cost ($)**	**Subtotal**	**Item Total ($)**
INSTALL SENTRY WELL				$30,000	$30,000		$30,000	$30,000		$30,000	$30,000		$30,000	$30,000
Mobilization	LS	1	$5,000	$5,000		$5,000	$5,000		$5,000	$5,000		$5,000	$5,000	
Well Installation	LS	1	$25,000	$25,000		$25,000	$25,000		$25,000	$25,000		$25,000	$25,000	
ESTABLISHING Pumping at SLP6														
Site Access	LS	0												
Pump Replacement	LS	0												
Drop Pipe	LF	0												
SURFACE WATER DISCHARGE				$62,800	$62,800		$62,800	$62,800						
Connection	LS	1	$5,000	$5,000		$5,000	$5,000							
Piping	LF	600	$13	$7,800		$13	$7,800							
Permitting	LS	1	$50,000	$50,000		$50,000	$50,000							
SANITARY SEWER DISCHARGE										$6,314,820	$6,314,820			
Connection	LS	1							$5,000	$5,000				
Piping	LF	150							$15	$2,250				
Permitting	LS	1							$1,000	$1,000				
Sewer access charge	LS	1							$6,306,570	$6,306,570				
CITY DISTRIBUTION SYSTEM													$7,800	$7,800
Connection	LS	1										$5,000	$5,000	
Piping	LF	100										$18	$1,800	
Permitting	LS	1										$1,000	$1,000	
TREATMENT							$1,580,000	$1,580,000					$1,580,000	$1,580,000
GAC unit and building	LS	1				$1,500,000	$1,500,000					$1,500,000	$1,500,000	
Carbon	LS	1				$80,000	$80,000					$80,000	$80,000	
Total Construction Costs (TCC):					*$92,800*			*$1,672,800*			*$6,344,820*			*$1,617,800*
Design (20% TCC)					$18,560			$334,560			$1,268,964			$323,560
Oversight (18% TCC)					$16,704			$301,104			$1,142,068			$291,204
Contingency (30% TCC)					$27,840			$501,840			$1,903,446			$485,340
TCC with Contingencies					**$155,904**			**$2,810,304**			**$10,659,298**			**$2,717,904**
ANNUAL O & M				$33,340	$33,340		$73,340	$73,340		$650,260	$650,260		$63,340	$63,340
Electricity	LS	1	$9,000	$9,000		$9,000	$9,000		$9,000	$9,000		$9,000	$9,000	
Labor	HR	124	$35	$4,340		$35	$4,340		$35	$4,340		$35	$4,340	
Carbon replacement	LS	1				$40,000	$40,000					$40,000	$40,000	
Discharge costs	UNIT	526.6							$1,200	$631,920				
Additional lab analyses	LS	1	*$20,000*	*$20,000*		*$20,000*	*$20,000*		*$5,000*	*$5,000*		*$10,000*	*$10,000*	
Annual O & M for 15 years					$500,100			$1,100,100			$9,753,900			$950,100
Total Alternative Cost:					**$656,004**			**$3,910,404**			**$20,413,198**			**$3,668,004**

T[redacted]3-5[redacted]

Summary of Detailed Evaluation for the PCJ FFS

Remedial Alternative	Protection of Health and Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction in Toxicity, Mobility and Volume	Short-Term Effectiveness	Implementability	Estimated Cost ($1,000)[1]	State Acceptance[2]	Community Acceptance[3]
Alternative 1: Re-establish pumping at W48	Controls contaminated water from reaching the Edina well field	ARARs are met	Pumping would be effective, and can be monitored as long as needed	Mobility would be limited by the gradient control well system	It may take one full construction season before pumping could begin. Pumping would be effective immediately.	Establishing pumping would be easily implemented. Discharge options would be limited to direct surface water, or to the sanitary sewer. Treatment facilities could not be built within ½ mile of well.	1A = $110 1B = $750 1C = $4,900 1D = $21,000 1D = $4,700	To be addressed by Agencies in ROD	To be addressed by Agencies in ROD
Alternative 2: Install Replacement well (well W119)[4]	Controls contaminated water from reaching the Edina well field	ARARS are met	Pumping would be effective, and can be monitored as long as needed	Mobility would be limited by the gradient control well system	It may take one full construction season before pumping could begin. Pumping would be effective immediately.	Easily implemented. Surface water would be quick and easy - sanitary and drinking water would be more difficult. No easy access for drinking water system.	2A = $110 2B = $660 2C = $4,800 2D = $21,000 2E = $4,600	To be addressed by Agencies in ROD	To be addressed by Agencies in ROD
Alternative 3: Establish full time pumping at SLP6	Controls contaminated water from reaching the Edina well field	ARARS are met	Pumping would be effective, and can be monitored as long as needed	Mobility would be limited by the gradient control well system	Pumping could begin immediately and would be effective immediately	This system is already built for both surface and sanitary discharge. A treatment plant would take a full construction season. Access is good.	3A = $110 3B = $550 3C = $3,800 3D = $21,000 3E = $3,600	To be addressed by Agencies in ROD	To be addressed by Agencies in ROD

1 Option A is the cost for installation and monitoring the sentry well for 15 years. Option B is discharge to surface water with no treatment. Option C is discharge to surface water after treatment. Option D is discharge to sanitary sewer. Option E is discharge to drinking water after treatment.
2 Expect DNR preference for beneficial use of groundwater resource.
3 Expect resistance to discharge in Minnehaha Creek during high flows. Expect resistance from MCES for high volume, low strength discharge. Expect general public resistance to perceived spreading of PAH into Minnehaha Creek.
4 All costs are based on using well W119.

Of the three alternative gradient control well locations, well W48 is located closest to the Reilly Site. Therefore, Alternative 1, establishing full time pumping at well W48, would pull groundwater containing higher concentrations of PAH the shortest distance from the Reilly Site. Well SLP6 is very near the southeastern limit of PAH contamination in the PCJ Aquifer, based on historical water quality results. Well SLP4 is pulling PAH from the Reilly Site even farther east than well SLP6.

3.5.1.1. Compliance with ARARs

All three alternatives would comply with ARARs. Drinking water criteria for PAHs (as presented in Section 1.4) would not likely be achieved at any of the pumping wells unless treatment was completed. Historically, well W48 contained total PAH concentrations in the range of one to two micrograms per liter, when it was pumped. Well SLP6 has shown total PAH concentrations in the 200 nanogram per liter range. Well W119 may be expected to contain total PAH concentrations greater than well SLP6, and less than well W48, after prolonged pumping.

Achievement of surface water criteria would likely be achieved for all three alternatives. If necessary, carbon adsorption treatment would be used to ensure that these criteria were achieved.

3.5.2. Long-Term Effectiveness and Permanence

Monitoring will be an effective long-term measure to ensure overall protection from PAH migration into the Edina well field. Pumping of groundwater through gradient control wells will not remove all PAH from the PCJ Aquifer. However, all three alternatives are expected to control impacted groundwater from entering the Edina well field. Any one of the three alternatives will further protect human health and the environment.

3.5.3. Reduction of Toxicity, Mobility or Volume Through Treatment

Assuming that pumping is necessary, all three alternatives would control the mobility of contaminants within the capture zone of each well. Treatment of groundwater removed from the aquifer is not a principal element of any of the alternatives, and only a small volume of the PAHs present would be destroyed (thereby reducing their toxicity).

3.5.4. Short-Term Effectiveness

The use of the sentry well will be effective in a relatively short period of time in providing the required PAH data. Any one of the three alternatives would be effective in preventing impacted groundwater from entering the Edina well field within a matter of days after pumping is commenced. Potential risks to the environment, community and on-site workers would be minimal for all alternatives. The level of effort to connect to the sanitary sewer or the City's water distribution system would be much greater for Alternatives 1 and 2 compared to Alternative 3.

3.5.5. Implementability

The use of a sentry well is the same for each alternative and is readily implementable. All three gradient control well alternatives are implementable. However, Alternatives 1 and 2 require the use of non-city owned property. It is expected that an access agreement with the Minneapolis Park Board would be easier to obtain (and possibly less costly) than one with Methodist Hospital.

The discharge options for each well reveal significant differences in the implementability of each option. If the extracted water is used as a drinking water supply, the only logical place to build and operate a treatment facility is at well SLP6. This is due to the presence of an iron removal plant, a water reservoir, and available City-owned property at well SLP6. Well SLP6 is also the logical option for directing the extracted water to the sanitary sewer. A sanitary sewer connection already exists for backflushing the iron removal plant.

If the extracted water can be discharged untreated to surface water, well SLP6 could be used with no significant further modifications. Well W119 would only need to have its pump pulled and repaired or replaced to be made serviceable. Well W48 would need a new pump installed, and a connection would need to be re-established to convey the water to Minnehaha Creek. Even though community acceptance is a modifying criteria, the surface water discharge option was found to be infeasible for well SLP4 due to strong public opposition. Therefore, despite the stated preference in the CD-RAP to pump SLP4 to surface water, the City ended up building a GAC treatment plant and using the water extracted from well SLP4 for drinking water supply. Based on this experience, it may not be possible to discharge to surface water, at least not without treating the water to essentially drinking water quality, despite the Agencies best efforts to issue a NPDES permit. If the water was treated prior to a surface water discharge, Alternative 1 would be the most difficult to implement due to the lack of space at Methodist Hospital. Wells W119 and SLP6 would probably be equally implementable in this regard, although if well SLP6 were pumped and treated, it would make more sense to drink the water rather than route it to Minnehaha Creek.

3.5.6. Cost

The cost to install a sentry well, and collect quarterly groundwater samples for part per trillion PAH analyses for 15 years is $110,000 for each alternative. If the concentration of PAH in the sentry well remains below the drinking water criteria, then no further costs would need to be incurred. If, however, the sentry well data indicate PAH migration towards the Edina well field, then the additional gradient control pumping would be needed.

The cost data generated for this study show that no matter which well is pumped, an untreated discharge to surface water is the least costly option, and, by comparison, a sanitary sewer discharge is prohibitively expensive. If an untreated surface water discharge cannot be accomplished, similar to the well SLP4 experience, then the least costly location to treat the water is at well SLP6. Therefore, assuming the sentry well data indicate the need to modify the PCJ Aquifer gradient control well system, Alternative 3 presents the lowest cost options for meeting the remedial goals of this project.

4.0 RECOMMENDED ALTERNATIVE

The City recommends Alternative 3, which consists of the installation and monitoring of a sentry well, followed by pumping at well SLP6, if PAH are discovered to be migrating towards Edina. The presence of complete, city-controlled facilities at well SLP6 allows the city to commit to Alternative 3, while having to commit only the capital costs associated with installing the sentry well for the immediate future. The following points form the basis for the City's preference of Alternative 3:

- The existing equipment and operational status of well SLP6 would allow well SLP6 to begin pumping immediately upon learning of PAH migration towards Edina via sentry well monitoring.
- Well SLP6 provides greater operational flexibility than wells W48 and W119. For example, well SLP6 could be pumped to surface water (or sanitary sewer) discharge during the construction of a GAC treatment plant.
- The fact that the City already owns the land and facilities at well SLP6 is a significant operational benefit to the City, and avoids potential liability.
- Alternatives 1 and 2 do not present any particular benefits, although the costs are somewhat higher compared to Alternative 3.
- The City already performs daily inspections at well SLP6 in conjunction with well SLP12; a Mount Simon-Hinckley Aquifer located in the same well house. Therefore, the City would not incur the extra expense of daily inspections at a new location.

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February 29, 2000

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Indianapolis, Indiana 46204-1763

Re: United States of America, et al. vs. Reilly Tar & Chemical Corporation, et al.
File No. Civ. 4-80-469
CD-RAP Section 3.4

Gentlemen:

The Focused Feasibility Study for the Prairie du Chien-Jordan Aquifer Gradient Control System submitted pursuant to Section 7.4 of the Consent Decree-Remedial Action Plan was sent out February 14, 2000. The cover letter was inadvertently dated March 15, 1999.

Any questions regarding this submittal can be directed towards this office.

Sincerely,

William M. Gregg

William M. Gregg
Project Leader for the
City of St. Louis Park

Enclosure

cc: Scott Anderson
Mike Rardin
Reilly File

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March 15, 1999

VIA CERTIFIED MAIL

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Re: United States of America, et al. vs. Reilly Tar & Chemical Corporation, et al.
File No. Civ. 4-80-469
CD-RAP Section 7.4

Gentlemen:

Enclosed is the Focused Feasibility Study for the Prairie du Chien-Jordan Aquifer Gradient Control System submitted pursuant to Section 7.4 of the Consent Decree-Remedial Action Plan in the above captioned matter. This report is issued by the City in accordance with the Agencies November 2, 1999 letter requesting an evaluation of modifications to the gradient control system, based on diminished pumping at well W48.

Any questions regarding this submittal can be directed towards this office.

Sincerely,

William M. Gregg

William M. Gregg
Project Leader for the
City of St. Louis Park

Enclosure

cc: Scott Anderson
Mike Rardin (w/o enclosures)
Reilly File